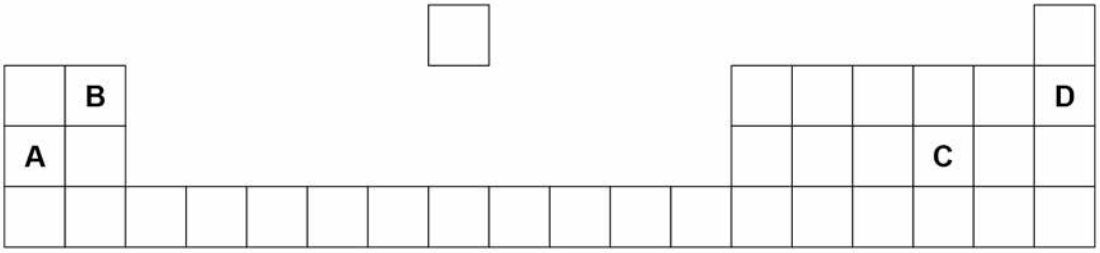
Do not write outside the box

0 4 This question is about the elements in Group 2 of the periodic table.

0 4 . 1 **Figure 9** shows the positions of four elements, **A**, **B**, **C**, and **D**, in the periodic table.

Figure 9



Which element is in Group 2?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Question 4 continues on the next page

Do not write outside the box

Group 2 metal carbonates break down when heated to produce a metal oxide and a gas.

metal carbonate → metal oxide + gas

0 4 . 2 Name the two products when calcium carbonate ($CaCO_3$) is heated.

[2 marks]

_____ and _____

0 4 . 3 What type of reaction happens when a compound breaks down?

[1 mark]

Tick **one** box.

- burning ☐
- decomposition ☐
- neutralisation ☐
- reduction ☐

0 4 . 4 The metal carbonate takes in energy from the surroundings to break down.

What type of reaction takes in energy from the surroundings?

[1 mark]

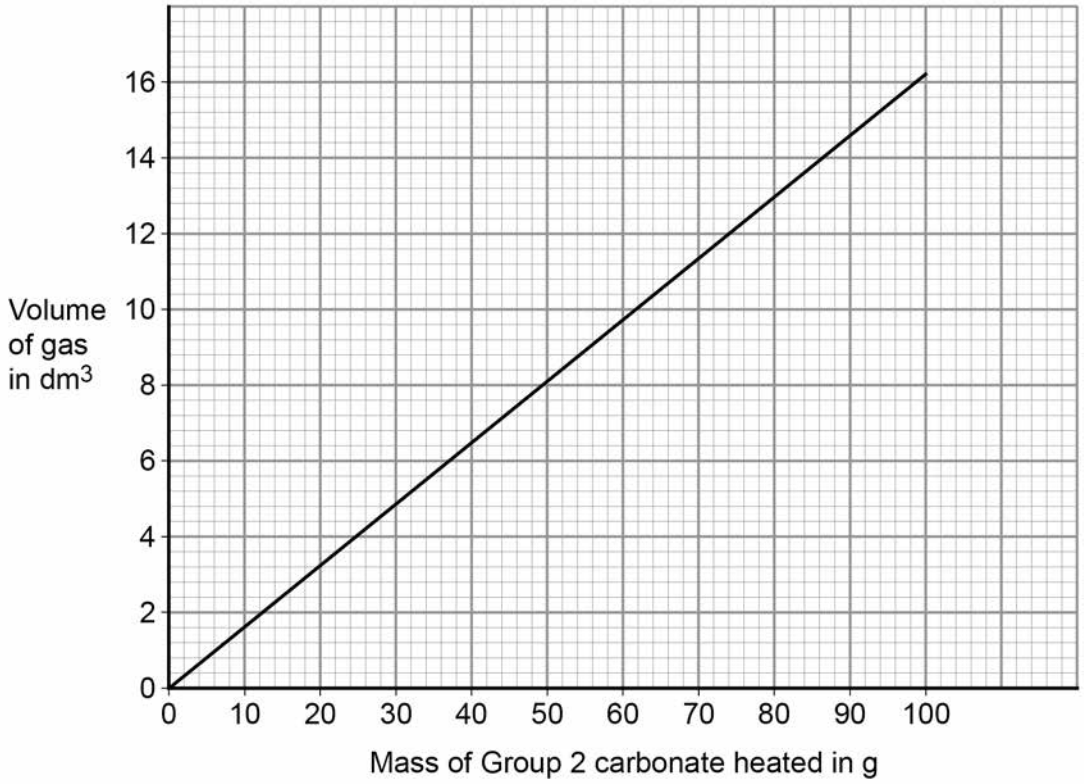
Tick **one** box.

- combustion ☐
- electrolysis ☐
- endothermic ☐
- exothermic ☐

Do not write outside the box

0 4 . 5 **Figure 10** shows the volume of gas produced when a Group 2 metal carbonate is heated.

Figure 10



The student collected 5.2 dm^3 of gas.

What mass of the Group 2 metal carbonate is heated?

[1 mark]

Mass = _____ g

0 4 . 6 Calculate the mass of the Group 2 carbonate needed to produce 24 dm^3 of gas.

Use your answer from question **04.5** to help you.

[2 marks]

_____

_____

_____

_____

Mass = _____ g

Turn over ►

Do not write outside the box

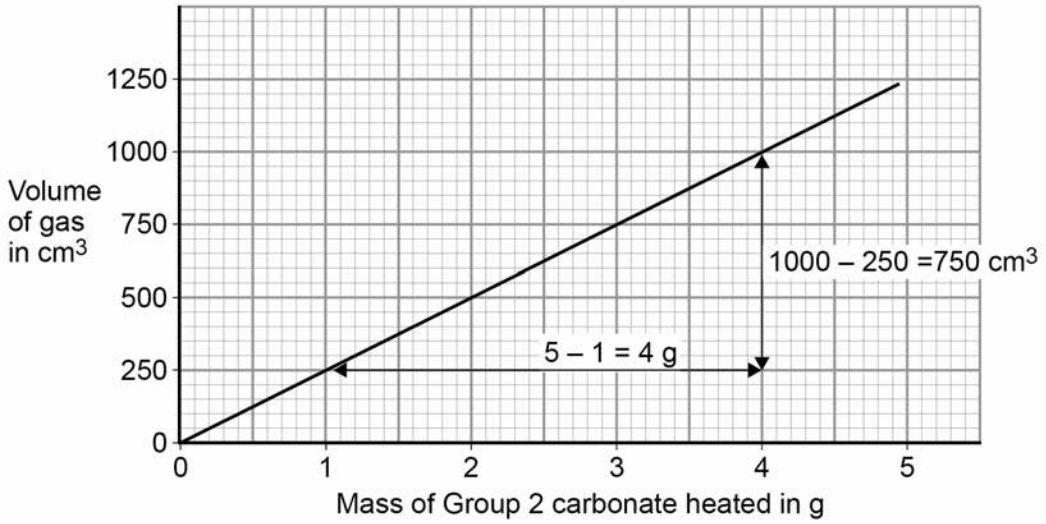
0 4 . 7 A student heated different masses of a Group 2 carbonate. The student measured the volume of gas produced.

Figure 11 shows a graph of the student's results.

The student calculates the gradient of the line in **Figure 11**

The student makes **two** mistakes.

Figure 11



Correct formula for gradient = $\frac{\text{Increase in volume of gas}}{\text{Increase in mass of Group 2 metal carbonate heated}}$

Student's calculation = $\frac{4}{750}$ = 0.00533 cm^3 per g

Identify the **two** mistakes the student makes.

Calculate the correct gradient of the line.

[4 marks]

Mistake 1 _____

_____

Mistake 2 _____

_____

Calculation _____

_____

Gradient = _____ cm^3 per g

Do not write outside the box

0 4 . 8 A student repeated the experiment with a different Group 2 metal carbonate ($\mathbf{X}CO_3$).

The relative formula mass (M_r) of $\mathbf{X}CO_3$ is 84

Relative atomic masses (A_r): C = 12 O = 16

Calculate the relative atomic mass (A_r) of **X**.

Name metal **X**.

Use the periodic table.

[4 marks]

Relative atomic mass (A_r) = _____

Metal **X** is _____

16

Turn over for the next question

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	B		1	AO2 5.1.2.1
04.2	calcium oxide **or** CaO carbon dioxide **or** CO_2	either order	1 1	AO1 5.1.1.1 5.3.1.3
04.3	decomposition		1	AO1 5.3.1.3
04.4	endothermic		1	AO1 5.5.1.1
04.5	32 (g)	allow 31–33 (g)	1	AO2 5.3.1.3
04.6		an answer of 148 (g) scores **2** marks allow ecf from question **04.5**		AO3 5.3.1.3
	$\frac{32}{5.2} \times 24$		1	
	148 (g) **or** uses graph eg 12 dm^3 gives 74 (g) (1) (then factors up so that 24 dm^3 gives) 148 (g) (1)	allow a range 143–153 (g) allow a range 143–153 (g)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7		mark mistakes and calculation independently		AO3 5.3.1.3
	(mistakes) increase in mass = 3 (not 4)	allow mistakes in either order	1	
	inserted numbers inversely into formula	allow numbers wrong way round	1	
	(calculation)	an answer of 250 scores the **2** calculation marks	1	
	gradient = $\frac{750}{3}$	allow $\frac{1000}{4}$		
	250 (cm^3 per g)	if no calculation marks awarded	1	
		allow $\frac{750}{3}$ **or** 187.5 **or** $\frac{3}{750}$ **or** 0.004 for **1** mark		
04.8		an answer of 24 scores the **3** calculation marks		AO2 5.3.1.2 5.3.1.3
	3 × 16 or 48		1	5.1.1.5
	(48) + 12 or 60	allow their mass of oxygen + 12	1	
	84 − (60) **or** 24	allow 84 − their mass of carbonate	1	
	magnesium **or** Mg	magnesium **or** Mg without working scores this mark	1	
Total			**16**	